

## WHAT IS CLAIMED IS

1. A bending method for producing a coil having return sections bent at 180° comprising:

providing a metallic pipe;

5        setting up a tangency point where a bend will occur;

pre-heating the pipe where the bend will occur at a temperature of between 570° F to 2200° F for a time of between 30 seconds to 60 minutes;

pre-bending the pre-heated pipe at 180° taking as bending reference point the tangency point in order to obtain a "U" shaped piece having two  
10       straight tube sections depending from a bent section;

heating the bent section at a temperature of between 570° F to 2200° F for a time between 1 to 60 minutes;

forming a final bending radius by applying a lateral pushing force along a straight section respectively and a pushing force on the tangency point  
15       perpendicular to the lateral pushing forces; and

applying a compression force to the entire "U" shaped piece in order to round the sections until the required roundness is obtained.

2. A method as claimed in claim 1, wherein the pipe is made of a metallic material selected from the group consisting of: carbon steel, copper and its  
20       alloys, stainless steel, low alloy steel and aluminum.

3. A method as claimed in claim 1 wherein the metallic pipe is of the type selected from the group consisting of: welded or seamless, extruded, ribbed (splined).

4. A method as claimed in claim 1 wherein the pipe has a thickness  
25       ranging from schedule 40 to XXS.

5. A method as claimed in claim 1 wherein the pre-heating is carried out by using an oxi-gas torch.

6. A method as claimed in claim 1, wherein the pre-heating is applied at the tangency point plus approximately 2".

5         7. A method as claimed in claim 1, wherein the pre-bending is carried out by using conventional means which may comprise any bending tool.

8. A method as claimed in claim 1, wherein in the pre-bending step, the pipe is bent until a bending radius  $R/D$  of 1 to 3 is obtained; wherein  $R$  = bending radius and  $D$  = external tube diameter.

10         9. A method as claimed in claim 1, wherein the final bending radius is formed by using a special press having two lateral pressure elements, each applying a lateral pushing force along a straight section respectively, and a pressure element which applies a pushing force on the tangency point perpendicular to the lateral pushing forces.

15         10. A method as claimed in claim 1, wherein each lateral pushing force is applied along a straight section for a distance of approximately 12" from the bent section.

11. A method as claimed in claim 1, wherein each step of the process is repeated until all the required return sections of the coil are formed.

20         12. A tubular cooling element comprising a coil having straight pipe sections and "U" shaped 180° elbow sections formed from a pipe having a wall thickness ranging from schedule 40 to XXS and wherein the coil does not have welded 180° elbows since the return sections are integral part of the pipe.